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| 10/065,331 | 10/04/2002 | Pierino Bonanni | 121601-1 | 2194 |
| 23413 | 7590 | 11/21/2003 | EXAMINER | |
| CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002 | | | LE, JOHN H | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2863 | |

DATE MAILED: 11/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,331

Applicant(s)

BONANNI ET AL.

Examiner

John H Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-32 are rejected under 35 U.S.C. 103(a) as being obvious over Bonanni (USP 6,536,284) in view of Bharadwaj et al. (USP 6,532,433).

The applied reference has a common assignee with the instant application.

Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned

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by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Regarding claims 1, 5, 11, 23, and 32, Bonanni teaches a system for detecting precursors to compressor stall/surge 14 comprising at least one sensor 30 positioned at said compressor 14 (Fig.2) to monitor at least one compressor parameter (e.g. Col.5, lines 32-37), said at least one sensor outputting raw data representative of said at least one compressor parameter (e.g. Col.5, lines 42-48); a frequency demodulator receiving said raw data, demodulating said raw data, and producing demodulated data (e.g. Col.5, line 57-Col.6, line 13), said pre-processing being at least partially performed in the digital domain (e.g. Col.5, lines 47-64); said pre-processing being at least partially performed in the analog domain (e.g. Col.3, lines 8-12).

Regarding claims 2, 24, Bonanni teaches at least one compressor parameter comprises one or more of a static pressure sensor sensing a static pressure of the gasses flowing through the compressor, a dynamic pressure sensor sensing a dynamic pressure of the gasses flowing through the compressor; a velocity sensor sensing a velocity of the gasses flowing through the compressor; and a forces and vibrations sensor sensing forces and vibrations exerted on a casing of said compressor (e.g. Col.2, lines 43-52).

Regarding claims 3-4, Bonanni teaches monitoring dynamic pressure at least one location within said compressor and monitoring dynamic pressure at a plurality of locations within said compressor (e.g. Fig.2, Col.5, lines 32-44).

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Regarding claims 6, 25, Bonanni teaches a calibration system for sampling and digitizing output from said at least one sensor to obtain time-series analyzed raw data, said frequency demodulator receiving said time-series analyzed raw data (e.g. Col.45-64).

Regarding claims 7-8, 26-27, Bonanni teaches a pre-filter to reject undesirable signals from said raw data prior to being input into said frequency demodulator, wherein said pre-filter comprises a band-pass filter centered on a locally dominant component of the input signal (e.g. Col.5, line 45-Col.6, line 13).

Regarding claims 9-10, 28, Bonanni teaches the locally dominant component is a tip-passage frequency of said compressor (e.g. Col.3, line 51-60).

Regarding claims 12, Bonanni teaches pre-processing comprises: pre-filtering time-series signals representing said at least one compressor parameter to reject undesirable signals; frequency demodulating the filtered signal to produce a demodulated signal having an amplitude corresponding to the instantaneous frequency of a locally dominant component of the input signal, and low pass filtering the demodulated signal to reduce noise interference to produce preprocessed signals (e.g. Col.3, lines 39-46).

Regarding claims 13, Bonanni teaches said pre-filtering comprises band-pass filtering said time-series analyzed data, said band pass filter rejecting all signals outside a band of frequency spectrum (e.g. Col.5, lines 45-52).

Regarding claims 14, Bonanni teaches said band is centered on the tip-passage frequency of compressor blades within said compressor (e.g. Col.5, lines 52-56).

Regarding claims 15, Bonanni teaches said frequency demodulating is performed such that said locally dominant component is the tip-passage frequency of compressor blades within said compressor (e.g. Col.3, lines 51-60).

Regarding claims 16, Bonanni teaches sampling and digitizing said preprocessed signals to produce time-series preprocessed data (e.g. Col.5, lines 45-52).

Regarding claim 29, Bonanni teaches the demodulator operates on said raw data in the analog domain (e.g. Col.3, lines 8-12).

Regarding claim 30, Bonanni teaches the demodulator operates on said raw data in the digital domain (e.g. Col.5, lines 47-64).

Regarding claim 31, Bonanni teaches a low-pass filter filtering the demodulated data to reduce noise interference prior (e.g. Col.6, lines 4-10).

Bonanni fails to teach a Kalman filter obtaining stall precursors from said demodulated data.

Bharadwaj et al. teach a Kalman filter 36 obtaining stall precursors measure (e.g. Col.5, lines 50-63, Col.6, lines 9-17).

Regarding claims 17, Bharadwaj et al. teach the Kalman filter computes a filtered estimate of locally dominant components of the preprocessed data (e.g. Col.2, lines 34-36).

Regarding claims 18, Bharadwaj et al. teach computing a standard deviation of innovations of said Kalman filter to determine a stall precursor signal (e.g. Col.2, lines 34-36).

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Regarding claims 19-22, Bharadwaj et al. teach comparing said stall precursor signal to a threshold, controlling said compressor to take corrective action when said precursor signal exceeds said threshold, corrective action is performed iteratively until the precursor signal is below said threshold, corrective action comprises reducing the loading on said compressor (e.g. Col.3, lines 22-56).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a Kalman filter 36 as taught by Bharadwaj et al. in a method and apparatus for compressor control and operation via detection of stall precursors using frequency demodulation of acoustic signatures of Bonanni for purpose of providing pro-actively monitoring and controlling the health of a compressor using stall precursors (Bharadwaj et al., Col.2, lines 18-25).

3. Claims 1, 5, 11, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khalid (USP 6,231,306) in view of Dent (USP 5,894,473).

Regarding claims 1, 5, 11, and 23, Khalid teaches a system for detecting precursors to compressor stall/surge 116 comprising at least one sensor 132 positioned at said compressor 116 to monitor at least one compressor parameter (e.g. Col.2, lines 59-65), said at least one sensor outputting raw data representative of said at least one compressor parameter (e.g. Figs.1, 2, Col.3, lines 6-26), said pre-processing being at least partially performed in the digital domain; said pre-processing being at least partially performed in the analog domain (e.g. Col.4, lines 52-62).

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Khalid fails to teach a frequency demodulator receiving said raw data, demodulating said raw data, and producing demodulated data; a Kalman filter obtaining stall precursors from said demodulated data.

Dent teaches a frequency demodulator 128 receiving said raw data, demodulating said raw data, and producing demodulated data (e.g. Fig.5 (a), Col.8, lines 14-19); a Kalman filter perform sequence of signal decoding and measurements from said demodulated data (e.g. Col.9, lines 25-29).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a frequency demodulator 128 and a Kalman filter as taught by Dent in a control system for preventing a compressor stall in a gas turbine engine of Khalid for purpose of providing the information signals to be transmitted over a common frequency spectrum (Dent, Abstract).

Other Prior Art

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Andrew et al. (USP 6,438,484) disclose a method and apparatus for detecting and compensating for compressor surge in a gas turbine using remote monitoring and diagnostics.

Contact Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John H. Le whose telephone number is (703) 605-4361. The examiner can normally be reached on 9:00 - 5:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on (703) 308-3126. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

John H. Le

Patent Examiner-Group 2863

November 14, 2003



John Barlow
Supervisory Patent Examiner
Technology Center 2600